two hours minimum. Approximately 300-400 bond pads of the size of approximately 1 mm×0.25 mm, with exposed gold surfaces, are located along the two long edges of the wafer. These pads are wirebonded (ball-bonding) to corresponding pads on the PCB using 1.5 mil gold wires. Wire bonding is a threading process, standard in semiconductor FAB. Alternatively, a flip-chip method may be used, though such methods are more complicated and may warp the wafer because of thermal mismatch. Wire bonds should have good integrity and pass defined pull strength. The substrate is baked at 120° C. for two hours and then the wire bonds are encapsulated by a compliant epoxy that will protect the wirebonds but not damage the bonds even at 120° C. Encapsulant should not spill over pre-defined area around the wirebonds and should not be taller than a defined height. For example, instead of laying epoxy all over the substrate, lines (e.g., a hash pattern) of it are made so that epoxy cures and air escapes through side. Alternatively, a laminate fill (adhesive on both sides) can be used. Standard connectors are soldered to the PCB and then the unit is tested using a test set-up to ensure all heaters and sensors read the right resistance values.

[0162] Pictures of an exemplary Mux board and assembled heater unit are shown in FIGS. **27-29**.

Example 3

Pulse Width Modulation

[0163] In various embodiments, the operation of a PWM generator can also include a programmable start count in addition to the aforementioned end count and granularity. In such embodiments, multiple PWM generators can produce signals that can be selectively non-overlapping (e.g., by multiplexing the on-time of the various heaters) such that the current capacity of the high voltage power is not exceeded. Multiple heaters can be controlled by different PWM signal generators with varying start and end counts. The heaters can be divided into banks, whereby a bank defines a group of heaters of the same start count. For example, 36 PWM generators can be grouped into six different banks, each corresponding to a certain portion of the PWM cycle (500 ms for example). The end count for each PWM generator can be selectively programmed such that not more than six heaters, for example, will be on at any given time. Other numbers are consistent with operation herein. A portion of a PWM cycle can be selected as dead time (count **3000** to **4000** for example) during which no heating takes place and sensitive temperature sensing circuits can use this time to sense the temperature. The table below represents a PWM cycle for the foregoing example:

	Start Count	End Count	Max End count
	Bank 1		
PWM generator#1	0	150	500
PWM generator#2	0	220	500
. . .	. . .	. . .	
PWM generator#6	0	376	500
	Bank 2		
PWM generator#7	500	704	1000
PWM generator#8	500	676	1000
. . .	. . .	..	. . .
PWM generator#12	500	780	1000
	Bank 3		
PWM generator#13	1000	1240	1500
PWM generator#14	1000	1101	1500
. . .	. . .	. . .	..
PWM generator#18	1000	1409	1500
	Bank 4		
PWM generator#19	1500	1679	2000
PWM generator#20	1500	1989	2000
. . .	. . .	. . .	. . .
PWM generator#24	1500	1502	2000
	Bank 5		
PWM generator#25	2000	2090	2500
PWM generator#26	2000	2499	2500
. . .	. . .	. . .	. . .
PWM generator#30	2000	2301	2500
	Bank 6		
PWM generator#31	2500	2569	3000
PWM generator#32	2500	2790	3000
. . .	. . .	. . .	. . .
PWM generator#36	2500	2678	3000

Example 4

Heater Unit

[0164] An exemplary design for a heater unit is found in U.S. design patent application Ser. No. 29/257,029 filed Mar. 27, 2006, the description of which is incorporated herein by reference in its entirety.

Example 5

Heater Circuitry Design

[0165] FIGS. **30**A-**30**C show an alternative heater circuit for heating a PCR chamber. FIG. **30**A shows 7 lanes in a microfluidic substrate that have a PCR chamber that is bulbous in shape. An inlet, valves, and a vent hole are disposed on either side of the chamber.

[0166] FIG. **30**B shows layout of heater circuitry that can activate the valves as well as heat the PCR chamber. The inset shows a representative heater element for a PCR chamber. It is rounded in shape and has both a central and a circumferential heater/sensor element.

[0167] FIG. **30**C shows fine structure of the heating elements of both the central and the circumferential heater/sensors. The overall arrangement promotes rapid and uniform heating of the PCR reaction chamber. The narrower wires in the central heater/sensor ensures that the center of the chamber receives most heat.

Example 6

Heater circuit Fine Structure

[0168] FIGS. **31**A and **31**B show, respectively, a set of heater arrays on a substrate, and a blown-up view of one representative array. In FIG. **31**B, various regions of the heater array are identified as A, B, and B'.

[0169] FIGS. **31**C and **31**D show, respectively, detailed views of regions A and B. Region A is identified with sub-